

## SHORT COMMUNICATION

### PARENTAL CARE IN THE NEOTROPICAL HARVESTMAN *PHAREICRANAUS CALCARIFERUS* (OPILIONES, CRANAIDAE)

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**ABSTRACT.** Parental care in harvestmen may take several forms including egg hiding, egg guarding, egg transport and young guarding. In most species, one adult, usually the female, performs guarding of the young. From 9 July–3 August 2005, we made observations of parental care by adults of the Neotropical cranaid harvestman *Phareicranaus calcariferus* (Simon 1879) in northern and central Trinidad. Nine observations involved an adult female and young while three appeared to include both an adult female and male with young. The number of young present was inversely related to the size of the young, indicating that parental care in this species may occur over an extended period of time.

**Keywords:** Biparental care, young guarding, Trinidad

Parental care can be generally defined as any behavior performed by an adult that enhances the survival of its progeny (Trivers 1972). Selective pressures that are believed to contribute to the evolution of parental care in harvestmen include predation (ants), cannibalism, and fungal infection (Mora 1990). In Neotropical harvestmen (Opiliones, Laniatores), parental care may take several forms including egg burying, egg hiding, egg carrying, and the guarding of eggs and early hatched nymphs (Machado & Raimundo 2001). Egg burying or egg hiding occurs when eggs are oviposited in the soil, among the leaf litter or in bark crevices (Machado & Raimundo 2001; Willemart 2001). In a few species, eggs may be laid and subsequently covered with debris (Willemart 2001; Pereira et al. 2004). Egg and young guarding specifically refers to a form of parental care in which one or both parents actively protect the progeny. In the gonyleptid species *Acutisoma longipes* Roewer 1913, the guarding female remains with the brood, occasionally touches the eggs with the second pair of legs, and regularly inspects the periphery of the clutch (Machado & Oliveira 1998; Machado 2002).

In Neotropical harvestmen, maternal care has been observed in at least 22 species representing four families including the Cosmetidae (Goodnight & Goodnight 1976), Gonyleptidae (Machado & Raimundo 2001), Stignopsidae (Mitchell 1971), and

Cranaidae (Machado & Warfel 2006). Of these taxa, egg hiding as well as egg and early nymph guarding by the female has been most extensively studied in the Gonyleptidae (Machado & Raimundo 2001). In *A. longipes*, maternal care includes egg and young guarding and may continue for a period of 56–78 days (Machado & Oliveira 1998). In contrast, paternal care has been observed in relatively few species, although it is known to occur in the Assamiidae (Martens 1993), Gonyleptidae (Machado et al. 2004), Manaosbiidae (Mora 1990), Podoctidae (Martens 1993), and Triaenonychidae (Forster 1954). Paternal care may take the form of egg transport (Martens 1993) or egg/young guarding (Mora 1990; Martens 1993; Hara et al. 2003; Machado et al. 2004). Biparental care of eggs or young has not been previously reported. However, in *Goniosoma albiscriptum* Mello-Letão 1932 and *A. longipes*, males will assume parental care if the guarding female is removed (Machado & Oliveira 1998; Willemart & Gnaspini 2004).

This paper reports the first field observations of parental care in the Neotropical harvestman *Phareicranaus calcariferus* (Simon 1879) (Cranaidae) in Trinidad. Over the course of 25 days (9 July–3 August 2005), we made 12 observations of egg and early nymph guarding involving multiple juveniles and one or two adults (Table 1). In each case, we observed the adult and young only briefly (1–3 min) and then collected them. Adults and nymphs were preserved in the field in 10% formalin and later transferred to 70% ethanol for storage. Vouch-

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Table 1.—Young guarding in *Phareicranaus calcariferus* of Trinidad. Mount Tamana consists of a seasonal forest. Petite Tacarib is crappo-cocorite seasonal forest (disturbed rainforest). Morne Bleu Ridge is a montane rainforest. Palm sheath refers to the sheaths of palm fronds of *Euterpe Broadwayii*.

Observation	Date	Location	Shelter	Number of young	Size of young	Adults present
1	9 Jul. 2005	Mount Tamana	log	≥ 25	larva	female
2	15 Jul. 2005	Petite Tacarib	log	4	late nymph	female
3	15 Jul. 2005	Petite Tacarib	log	≥ 25	larva	female
4	26 Jul. 2005	Morne Bleu Ridge	palm sheath	7	late nymph	female
5	26 Jul. 2005	Morne Bleu Ridge	palm sheath	17	early nymph	female
6	26 Jul. 2005	Morne Bleu Ridge	palm sheath	25	larva	female
7	26 Jul. 2005	Morne Bleu Ridge	palm sheath	25	larva	female
8	26 Jul. 2005	Morne Bleu Ridge	palm sheath	17	early nymph	female
9	26 Jul. 2005	Morne Bleu Ridge	palm sheath	20	early nymph	female
10	2 Aug. 2005	Morne Bleu Ridge	palm sheath	40	early nymph	female, male
11	3 Aug. 2005	Morne Bleu Ridge	palm sheath	4	late nymph	female, male
12	3 Aug. 2005	Morne Bleu Ridge	palm sheath	30	early nymph	female, male

er specimens were deposited into the natural history collections of the California Academy of Sciences, San Francisco (CAS) and Louisiana State Arthropod Museum, Baton Rouge (LSAM). In the field, adults were observed in close proximity to the nymphs, with their legs directly contacting those of one or more of the young. Nymphs and adults were collected from within or beneath a shelter (Table 1), either a rotting log or the sheath of a palm frond (*Euterpe Broadwayii*). Our first observation occurred on 9 July 2005 on the slope of Mount Tamana (10°28'15.5"N, 61°11' 50.5"W; datum: WGS84) in the Central Range. The maximum elevation at this site is 325 m and the habitat that is present is a mixture of crappo-cocorite (jungle) and evergreen seasonal forest with a diverse assemblage of lianas and bromeliads (Murphy 1997). The second and third observations occurred on 15 July 2005 in the forests adjacent to the beach at Petite Tacarib (10°47'38.8"N, 61°13' 32.7"W; datum: WGS84) along the northern coast. At this location, the dominant habitat is disturbed rainforest (crappo-cocorite) and features several species of palms, bromeliads, and an understory dominated in many places by *Heliconia*. The remaining nine observations occurred from 26 July–3 August 2005 along Morne Bleu Ridge (10°43'59.3"N, 61°16'13.2"W; datum: WGS84) within 1 km of the summit of Mount Aipo in the Northern Range. The elevation of this area ranges from 700–840 m and the vegetation is characteristic of montane rainforest, featuring an abundance of lianas, bromeliads, palms and a relatively low canopy (6–12 m).

Nine of our observations involved the association of a single adult female and young (no male was observed or captured in the immediate vicinity of the shelter), while three instances involved both an adult female and male with early nymphs (Table 1).

We also made four observations from 26 July–2 August 2005 along Morne Bleu Ridge in which male and female harvestmen were found together, but there were no eggs or young present. In addition, an unguarded group of small young and a single unguarded clutch of eggs were found within the sheaths of palm fronds on 26 July 2005. We noted an inverse relationship between the number and the size of the young that were found. In general, the smallest instars (mean dorsal scute 2.1 mm, range 1.8–2.5 mm) also known as larvae (the first instar after hatching) were found in relatively large numbers (Table 1). Early (mean dorsal scute 3.6 mm, range 2.8–4.2 mm) and late nymphs (mean dorsal scute 5.2 mm, range 4.5–6.6 mm) were generally found in smaller numbers (Table 1). Our observations in the field were limited to generally 1–3 min because the adults and nymphs would disperse rapidly from the area once the shelter had been disturbed. Although we infer a guarding function for this behavior, we did not observe any instances of active defense of the young by the adults.

Our field study of *P. calcariferus* represents the first report of the reproductive biology for this species and is only the second observation of parental care for the Cranaidae and for harvestman in Trinidad (Machado & Warfel 2006). These observations indicate that this species exhibits maternal care and that guarding nymphs may involve both sexes. In two instances, we found unguarded eggs or juveniles. These observations may represent instances in which the guarding parent(s) had abandoned the brood, left in search of food, or were present but simply not found.

The inverse relationship between the number of nymphs present and body length of the juveniles indicates that the association between young and at least one of the parents may last for several weeks



or even months. We infer from the increases in body size that at least the first three instars of *P. calcariferus* may be guarded by at least one adult. This observed pattern also suggests that as the juveniles mature, they may either disperse or incur greater mortality due to predation.

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